may be implemented through Firmware as part of the application specific integrated circuit.

[0042] The conversion process, on the other hand, is implemented to adjust the raw data into other form factors before sending or reporting them to the host device **24**. That is, the controller **38** may convert the raw data into other types of data. The other types of data may have similar or different units as the raw data. In the case of the touch pad **36**, the controller **38** may convert the position data into other types of position data. For example, the controller **38** may convert absolute position data to relative position data. As should be appreciated, absolute position refers to the position of the finger on the touch pad measured absolutely with respect to a coordinate system while relative position refers to a change in position of the finger relative to the finger's previous position. The controller **38** may also convert multiple absolute coordinates into a single absolute coordinate, Polar coordinates into Cartesian coordinates, and/or Cartesian coordinates into Polar coordinates. The controller **38** may also convert the position data into button data. For example, the controller may generate button control signals when an object is tapped on a predetermined portion of the touch pad or other control signals when an object is moved in a predetermined manner over the touch pad (e.g., gesturing).

[0043] The conversion may also include placing the control signal in a format that the host device **24** can understand. By way of example, the controller **38** may follow a predetermined communication protocol. As is generally well known, communication protocols are a set of rules and procedures for exchanging data between two devices such as the user interface **22** and the host device **24**. Communication protocols typically transmit information in data blocks or packets that contain the data to be transmitted, the data required to guide the packet to its destination, and the data that corrects errors that occur along the way. The controller may support a variety of communication protocols for communicating with the host device, including but not limited to, PS/2, Serial, ADB and the like. In one particular implementation, a Serial protocol is used.

[0044] The conversion process may include grouping at least a portion of the native coordinates **40** together to form one or more virtual actuation zones **42**. For example, the controller **38** may separate the surface of the touch pad **36** into virtual actuation zones **42**A-D and convert the native values of the native sensor coordinates **40** into a new value associated with the virtual actuation zones **42**A-D. The new value may have similar or different units as the native value. The new value is typically stored at the controller **38** and subsequently passed to the host device **24**. Generally speaking, the controller **38** outputs a control signal associated with a particular virtual actuation zone **42** when most of the signals are from native sensor coordinates **40** located within the particular virtual actuation zone **42**.

[0045] The virtual actuation zones **42** generally represent a more logical range of values than the native sensor coordinates **40** themselves, i.e., the virtual actuation zones **42** represent areas of touch pad **36** that can be better actuated by a user (magnitudes larger). The ratio of native sensor coordinates **40** to virtual actuation zones **42** may be between about 1024:1 to about 1:1, and more particularly about 8:1. For example, the touch pad may include 128 virtual actuation areas based on 1024 native sensor coordinates.

[0046] The virtual actuation zones **42** may be widely varied. For example, they may represent absolute positions on the touch pad **36** that are magnitudes larger than the native sensor coordinates **40**. For example, the touch pad **36** can be broken up into larger slices than would otherwise be attainable using the native sensor coordinates **40**. In one implementation, the virtual actuation zones **42** are distributed on the touch pad **36** within a range of 0 to 95 angular positions. The angular position is zero at the 12 o clock position and progresses clockwise to **95** as it comes around to 12 o'clock again.

[0047] The virtual actuation zones **42** may also represent areas of the touch pad that can be actuated by a user to implement specific control functions such as button or movement functions. With regards to button functions, the virtual actuation zones **42** may correspond to button zones that act like touch buttons. With regards to movement functions, each of the virtual actuation zones **42** may correspond to different movement directions such that they act like arrow keys. For example, virtual actuation zone **42**A may represent an upward movement, virtual actuation zone **42**B may represent a downward movement, virtual actuation zone **42**C may represent a left movement, and virtual actuation zone **42**D may represent right movement. As should be appreciated, this type of touch pad configuration may enable game stick implementations, two dimensional menu selection, photo image panning and the like.

[0048] Although not shown, the controller **38** may also include a storage element. The storage element may store a touch pad program for controlling different aspects of the user interface **22**. For example, the touch pad program may contain virtual actuation zone profiles that describe how the virtual actuation zones are distributed around the touch pad relative to the native sensor coordinates and what type of value to output based on the native values of the native sensor coordinates selected and the virtual actuation zone corresponding to the selected native sensor coordinates.

[0049] In one particular touch pad operation, the controller **38** receives the position data from the touch pad **36**. The controller **38** then passes the data through a filtering process. The filtering process generally includes determining if the data is based on noise events or actual events. Noise events are associated with non significant events such as when a user's finger is simply resting on a spot and moving ever so slightly because of finger balance. Actual events are associated with significant events such as when a user decides to move his/her finger to a new position on the touch pad. The noise events are filtered out and the actual events are passed through the controller **38**.

[0050] With actual events, the controller **38** determines if the position data should be adjusted. If not, the position data is reported to the host device **24**. If so, the position data is converted into other form factors including but not limited to other position data or button data. For example, the native values of the sensor coordinates are converted into a new value associated with a selected virtual actuation zone. After the conversion, the controller **38** reports the converted data to the host device **24**. By way of example, the controller **38** may pass the new value to a main system processor that executes the main application program running on the host device **24**.

[0051] Referring to the host device **24**, the host device **24** generally includes a control circuit **26**. The control circuit **26**